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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No. 10/017,733	Applicant(s) LIANG ET AL.	
	Examiner Daniel F Hajnik	Art Unit 2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 December 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,12-14,16,18,19,21,22,26,28-30,32-37,40,41,45 and 46* is/are rejected.

7)☒ Claim(s) *8-11,15,17,20,23-25,27,31,38,39,42-44 and 47* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 December 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: Page 7, line 10, the statement "if the difference is negative positive," the examiner will assume the applicant meant to say "if the difference is negative,".

Appropriate correction is required.

Claim Objections

2. Claim 47 is objected to because of the following informalities: The preamble is difficult to understand please consider using a preamble with simpler wording such as in claim 23, which has similar limitations to claim 47.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-7, 12-14, 16, 18-19, 21-22, 26, 28-30, 32-37, 40-41, and 45-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arai (US Patent 6121977) in view of Colwell (US Patent 5877777).

5. In regards to claim 1, the computer-implemented process includes the limitation of "inputting an image of a scene". Arai (6121977) teaches of inputting an image of a scene for reflection in col 5, lines 55-59.

The process includes the further limitations of "generating a reflection copy of the scene depicted in the input image to create a water region image". Arai (6121977) teaches of reflecting the object (input image) onto the water surface in col 5, line 55-59.

The process includes the further limitations of "merging the input image and water region image, and sizing the merged image to fit a desired frame size, to produce a first frame of the video". Arai (6121977) teaches of merging the water image and object (input image) in col 5, line 55-59. It would have been obvious to one of ordinary skill in the art to resize the image to fit the frame size.

The process includes the further limitations of "generating a sequence of additional frames, each of which comprises a distorted version of the water region of the immediately preceding frame in which any ripple simulated in the immediate preceding frame is shown in a new location that simulates the natural motion of a ripple across a surface of a body of water". Arai (6121977) states "The fifth aspect is arranged such that the ellipses are displayed large for each frame to express the ripples" (col 4, lines 11-13).

The process includes the further limitations of "distorting the water region portion of the merged image to simulate at least one ripple originating at a site selected by a viewer". Arai (6121977) teaches of distorting the water region and

the merged image (col 4, lines 25-26), however does not teach of using a site selected by the user.

Colwell (5877777) states in the background that one of the reasons for creating the disclosed system is because "Studio MAX® product does not provide the capability to place and optionally move an object in the fluid body context" (col 1, lines 39-41). Therefore the reference, Colwell (5877777) suggests user interaction of the object location in the fluid body for improvement and the user interface figure 6 suggest this capability.

It would have been obvious to one of ordinary skill in the art combine the water reflection and distortion system of Arai (6121977) with the user interface and water/fluid manipulation system of Colwell (5877777). Colwell (5877777) suggests the advantage of the combination by stating "A novel fluid dynamics model is used which requires only the solution of a small set of simple pressure and flow equations" (col 1, lines 54-56) and "it has been assumed to this time, ... that solution of the Navier-Stokes equations was required (for fluid body contact), and imposed a prohibitive processing overhead and associated cost" (col 1, lines 41-47).

Arai (6121977) suggest the desire for speed improvements to achieve realistic, real time graphics processing for water by stating "If the computer graphics is able to display a created image of the water surface (with movement)..., reality can be given to the whole image" (col 1, lines 63-65) and states "However, it is difficult for the improved performance of the present

computer to create a dynamic image in real time while simulating the foregoing movements" (col 1, line 66 – col 2, line 1)

In regards to claim 2, the process action of merging includes the further limitation of "disposing the input image in the upper portion of the merged image", and "disposing the water region image in the lower portion of the merged image with an upper edge thereof placed adjacent to a lower edge of the input image such that the water region image is oriented so as to appear as an upside down copy of the input image". Arai (6121977) teaches these limitations in a similar manner (reflection of image on the body of water) as shown in figures 1 and 34.

In regards to claim 3, the process action of creating the water region has the addition step of "applying a reflection attenuation factor to the reflection copy of the input image which has the effect of obscuring the depicted scene". Arai (6121977) teaches of obscuring the reflected image as shown in figures 1 and 34 but not teach of using an attenuation factor to do so. Colwell (5877777) shows in figure 12 an option to change the ripples damping value (attenuation factor). It would have obvious to one of ordinary skill in the art to combine these two features.

In regards to claim 4, the reflection attenuation process includes the further limitation of "an action of scaling down the intensity of each pixel in the

water region image by an amount specified by the factor". Arai (6121977) teaches of "color of the pixels ... which is generated first is considerably different from the color of the adjacent pixels" and "the color of the pixel of the ellipse which is generated later is gradually made to be the same as the color of the adjacent pixels" (col 4, lines 17-22).

In regards to claim 5, Arai (6121977) does not specifically teach that the reflection attenuation process includes the further limitation of "wherein the degree to which the depicted scene is obscured by application of the reflection attenuation factor is selected by a user". However, Colwell (5877777) shows in figure 12 an option to change the ripples damping value (attenuation factor). Combining the user interface of Colwell with the image reflection on the body of water in figure 1 or figure 34 of Arai (6121977) would have been obvious to one of ordinary skill in the art.

In regards to claim 6, the ripple distortion process includes the further limitations of "moving a pixel or pixels associated with each said locations to the new image coordinates". Arai (6121977) teaches "Since the ellipse drawing means performs drawing by copying the colors of pixels adjacent to pixels of the ellipse to be drawn in such a manner that ellipses which will be drawn later have pixels to be copied and pixels to be drawn ..." (col 4, lines 12-17).

Arai (6121977) does not teach inputting the location of each site selected by the viewer. Colwell (5877777) shows a user interface in figure 6 that would

suggest allowing the user to select the location of the ripples. Colwell (5877777) states one of the reasons for creating its system is "Studio MAX® product does not provide the capability to place and optionally move an object in the fluid body context" (col 1, lines 39-41). Colwell (5877777) shows in figure 10 and teaches "This sub-window or panel 68 permits the user to Select or specify the Stones" (col 8, lines 34-36) where the stones are used to create ripples.

Arai (6121977) does not teach the further limitation of "establishing a height map comprising a plurality of points each of which is assigned a height value and each of which corresponds to a different location of the water region portion of the merged image". Colwell (5877777) shows a height map in figures 2 and 3. Colwell (5877777) describes the height map in the following manner "Mesh M will be understood to be a wire-frame planar surface that represents a two-dimensional (2D) right rectangular array of cells that represent, in turn, the surface of a fluid body being animated in accordance with the invented system and method" (col 10, lines 4-10). The Mesh M in this reference is performing the same function in a similar way as the height map disclosed in the application.

Arai (6121977) does not teach the further limitations of imposing a ripple mask at user selected locations where the height mask modifications correspond to the correct height map values. Colwell (5877777) teaches of using a ripple mask in figure 10 and describes the process as "The mask feature permits free-form shaping of a fluid body for animation by defining the boundary thereof outside of which no fluid dynamics occur" (col 8, lines 34-42). Colwell (5877777) teaches of a similar method for modifying the height map as the mask shown in

figure 4, part 36 (the pressure profile) (described in col 6, lines 53-61) where the height map modifications in surrounding neighboring cells is symmetric around the central impact area of the ripple.

Arai (6121977) does not teach the further limitations of "computing new image coordinates for each location in the water region of the merged image that correspond to a height map point using the height map values associated with each of said locations". Colwell (5877777) describes the process for computing new image coordinates in cols 5 and 6 where the reference bases these methods on the fluid exchange between neighboring cells in the height map and on their height differences for all water dynamics including waves, ripples, or droplets (col 5, lines 10-16).

In regards to claim 7, Arai (6121977) does not teach that the height map construction process includes the additional limitation of "establishing a separate height map point for each pixel of the water region portion of the merged image". Colwell (5877777) shows a pool mesh size box and pool mesh density setting in figure 12. This option can be set to let the user make each cell in the pool mesh (height map) correspond to each pixel on the screen. It would have been obvious to one of ordinary skill in the art to set the cell size of height map cell to correspond to a pixel on the screen for simplicity of understanding and design.

In regards to claim 12, the frame sequence generating process includes the additional limitations of "computing new image coordinates for each location

in the water region of the frame being generated that correspond to a height map point using the new height map values associated with each of said locations". Arai (6121977) shows a similar process in figure 3A-3D using horizontal slices for computing new image coordinates. It would have been obvious to one of ordinary skill in the art to extend the new image coordinates from the horizontal slices to individuals cells of a height map like the one used in Colwell (5877777) and shown in figures 2 and 3 of Colwell (5877777).

The frame sequence generating process includes the additional limitations of "moving a pixel or pixels associated with each of said locations to the new image coordinates". Arai (6121977) shows the movement of pixels in figure 3A-3D between frames in a sequence.

Arai (6121977) does not teach that the frame sequence generating process includes the additional limitations of "computing a new height map for the frame being generated from the height map associated with the immediately preceding frame". Colwell (5877777) teaches of generating the new heights for each cell for the new frame from using the data of the neighboring cells of the previous frame and as described in equations 4 and 5 (see col 5, 63 – col 6, 11).

In regards to claim 13, Arai (6121977) does not teach the process described for generating a new height map. Colwell (5877777) teaches of using a similar process. Colwell (5877777) states that equation 1 is based on “Those of skill in the art will appreciate that the expression in the brackets represents the average flow exchange between cells A and B over time interval delta t” (col 5,

lines 43-45). The limitations of the claim are also describing a similar process for averaging the height of the cell by using the surrounding cells. Colwell (5877777) has a similar setup for its Mesh (height map) as the application and the system of Colwell (5877777) can apply equation 1 to the other surrounding cells (C, D, E) shown in figure 3 to produce an averaging of the height value of the cell in a similar method as described in the claim.

In regards to claim 14, the claim has many of the same limitations discussion in claim 13, therefore the same prior art rejection argument applies for those limitations, and only differences will be addressed.

Arai (6121977) does not teach the limitation of "applying a damping factor to the resultant height value to produce a damped resultant height value" and "assigning the damped resultant height value to the height map". Colwell (5877777) teaches of using a damping value shown in figure 12, and seen from the small drawing next to the damping label, the waves are becoming diminished which would indicate that this value is used in a similar manner as described in the claim limitations.

In regards to claim 16, Arai (6121977) does not teach the limitation of "the damping factor is selected by the viewer". Colwell (5877777) teaches of using a user selected damping value shown in figure 12.

In regards to claim 18, the frame sequence generating process includes the additional limitation of "a process action of distorting the water region portion of the frame being generated to simulate at least one ripple originating at a site selected by a viewer". The limitations of distortion the water using user selected ripples was already addressed in claim 1 and follow the same lines of prior art rejection for those particular limitations within claim 1. Arai (6121977) teaches of using ripple distortion for a sequence of frames in col 4, lines 11-13.

In regards to claim 19, Arai (6121977) does not teach that the ripple distortion process includes the further limitation of "displaying the immediately preceding frame to the viewer and inputting the location of each site selected by the viewer in the water region of said preceding frame". The limitation of inputting the location selected by the user has already been addressed in claim 18. It would have been obvious to one of ordinary skill in the art to display the preceding frame while inputting locations from that frame in an animation sequence for water distortion.

Arai (6121977) does not teach that the ripple distortion process includes the further limitation of "imposing a ripple mask onto the new height map" where the height map values correspond correctly to the ripple mask value modifications. Colwell (5877777) shows an option for a ripple mask for use with stones dropped into the water, which create ripples in figure 10. It would have been obvious to one of ordinary skill in the art to have the height map values correctly correspond to the ripple mask value modifications.

In regards to claim 21, the system for generating a video has claim limitations that closely match those disclosed in claim 1 for the computer implemented process. It would have been obvious to one familiar in the art to extend the interactive water effects of the computer implemented process to a system of generating a video. Therefore, those claim limitations are subject to the same prior art rejection and only differences will be addressed.

Arai (6121977) does not teach that the system for generating a video includes the further limitations of "further distort the water region portion of the merged image to simulate a periodic wave". Colwell (5877777) shows a periodic wave resulting for a stone impact in the water in figure 5 and describes the waves as being "sinusoidal" (col 7, lines 5-7).

In regards to claim 22, the water region distortion module includes the further limitation of "moving a pixel or pixels associated with each of said locations to the new image coordinates". Arai (6121977) teaches of moving pixels of the image area in figures 3A-3D. It would have been obvious to move the pixels of the image to correspond to the new image coordinates.

Arai (6121977) does not teach that the water region distortion module includes the limitation of "establishing a height map comprising a plurality of points each of which is assigned a height value and each of which corresponds to a different location of the water region portion of the merged image". Colwell (5877777) shows a height map in figures 2 and 3.

Arai (6121977) does not teach that the water region distortion module includes the further limitation of "generating periodic wave height values for each height map point which simulate the shape and location of a wave on the surface of a body of water at a given point in time". Colwell (5877777) describes the process for generating periodic waves from a resulting stone impact in col 7, lines 5-21.

Arai (6121977) does not teach that the water region distortion module includes the further limitation of "computing new image coordinates for each location in the water region of the merged image that correspond to a height map point using the height map values and periodic wave height values associated with each of said locations". Colwell (5877777) states "Where there are multiple waves ... a phenomenon called wave superposition, or interference, results ... by summing the pressure vectors ... that represents the net pressure on that cell" (col 6, lines 34-47). Here, the reference teaches that the height values are affected by the waves and the new coordinates of the wave are computing by finding the net pressure on that area.

In regards to claim 26, the limitations of the program module closely follow the limitations of claim 12, a process action. The program module of claim 26 is performing a similar function in a similar way as the process action in claim 12 and is subject to the same prior art rejection.

In regards to claim 28, the computer-readable medium having computer-executable instructions for generating a video has limitations that closely match those disclosed in claim 1 for the computer implemented process.
It would have been obvious to one familiar in the art to extend the interactive water effects of the computer implemented process to a computer-readable medium.

In regards to claim 29, the computer implemented process for generating a video depicting water effects includes the further limitations of a process action for "inputting a texture map that is used in conjunction with a model of a scene to generate an image of the scene". Arai (6121977) teaches of inputting an existing image in col 5, lines 55-67. It would have been obvious to one of ordinary skill in the art to substitute a texture map for an image because both can be represented using the same data design and file format, and because textures are very often represented as images.

The computer implemented process for generating a video depicting water effects includes the further limitations of a process action for "generating a reflection copy of the texture map and sizing it to match the overall size of the grid to create a water region texture map". Arai (6121977) teaches of generating a reflection copy in col 5, lines 55-67 and shows sizing an image (or texture map) in the water in figure 34 or figures 33A-C.

The computer implemented process for generating a video depicting water effects includes the further limitations of a process action for "merging the input

texture map and water region texture map to create a combined texture map" and where input texture map fits an upper region and the water region texture map in the lower region is upside down. Arai (6121977) teaches of generating a merging an input image (or texture map) and the water, and generating a lower image (or texture) copy upside down in figure 34.

Arai (6121977) does not teach that the computer implemented process for generating a video depicting water effects includes the further limitations of a process action for "defining a orthogonal grid comprising a plurality of vertex points, said grid being sized to match a desired size of a water region in an overall scene depicted in each frame of the video". Colwell (5877777) shows an orthogonal grid in figure 2 and states "permits the user to define whether the center or edge of Mesh M is affected when the mesh is created by pointing and clicking cursor control device 32 to drag, and thus to define a mesh object" (col 8, lines 17-21). Here, the reference teaches the Mesh M (orthogonal grid) has a user selected size that can be sized to match the water region.

Arai (6121977) does not teach that the computer implemented process for generating a video depicting water effects includes the further limitations of a process action for "superimposing the grid on the water region texture map and associating each point of the grid with the closest water region texture map coordinate". Colwell (5877777) in figure 2 shows the vertices of the grid assigned height values in order to represent the surface of a body of water. It would have been obvious to merge the image or texture of Arai (6121977) with

the vertices of Colwell (5877777) since they both are part of representing the surface of a body of water.

Arai (6121977) does not teach that the computer implemented process for generating a video depicting water effects includes the further limitations of a process action for rendering a sequence of frames to simulate distortion movement over a water region where the grid is used in conjunction with the combined texture map. It would have been obvious to merge the image or texture of Arai (6121977) with the vertices of Colwell (5877777) to depict water effects because of the same reasons stated above and because both systems already depict water effects such as waves or ripples.

In regards to claim 30, Arai (6121977) does not teach that the process of defining a orthogonal grid has the additional limitations of "establishing the coordinates of the four corner vertices of the video frames". Colwell (5877777) in figure 2 shows an orthogonal grid with 4 corners. Although Colwell (5877777) in figure 6 shows the orthogonal grid to appear infinite in all directions the disclosure states that Mesh M (orthogonal grid) is a "two-dimensional (2D) right rectangular array of cells" (col 4, lines 16-20) and states the user selected size of Mesh M is defined within user defined bounds (col 8, lines 17-21).

Arai (6121977) does not teach that the process of defining a orthogonal grid has the additional limitations of "specifying a height of a horizontal line which divides said upper and lower portions of the video frame". Fig 6 shows a horizontal line in window 60 that divides the upper and lower portions.

Arai (6121977) does not teach that the process of defining a orthogonal grid has the additional limitations of "specifying the number of equally-spaced horizontal grid lines and the number of equally-spaced vertical grid lines to be employed in the grid". Colwell (5877777) in figure 2 shows both equally spaced horizontal and vertical lines.

Arai (6121977) does not teach that the process of defining a orthogonal grid have the additional limitations of "identifying the grid coordinates of each vertex of the grid given the specified number of horizontal and vertical grid lines". Colwell (5877777) in figures 2 and 3 show the grid coordinates based upon the vertices of the grid.

In regards to claim 32, Arai (6121977) does not teach that the process of specifying the number of equally-spaced horizontal and vertical lines in the grid has the limitation of "inputting viewer-selected numbers for each". Colwell (5877777) in figure 12 shows a user input fields for changing the number of horizontal and vertical lines in the Pool Mesh (orthogonal grid).

In regards to claim 33, Arai (6121977) does not teach that the process action of specifying the number of equally-spaced horizontal and vertical line in the grid has the additional limitations of "specifying a number of horizontal grid lines and a number of vertical grid lines" where the spacing between the horizontal grid lines exceeds the spacing between the vertical grid lines. Colwell

(5877777) in figure 12 shows a user input fields that can make the horizontal spacing greater than the vertical spacing in the Pool Mesh (orthogonal grid).

In regards to claim 34, the computer-implemented process includes the additional limitations of "wherein the overall scene in the rendered frames fill the entire frame, and wherein the frame size is made equal to the viewing portion of a screen of a display device being used by the viewer to view the video, such that a full screen video is produced". Arai (6121977) shows the overall scene frame to equal the viewing portion of the screen in figure 1, piece 14.

In regards to claim 35, the computer-implemented process includes the additional limitations of "wherein the unit height of the height values associated to a vertex of the grid associated with a combined texture map is scaled so that all height values are integer numbers". Arai (6121977) in the process for generating a wave at a short distance states "If the position (vj-uj+1)xk is not an integer, writing to the adjacent pixel may be permitted" (col 17, lines 7-10). It would have been obvious to one familiar in the art to extend this functionality of Arai (6121977) to the orthogonal grid of Colwell (5877777) since one of the major purposes of the grid is to represent waves on a plain of water, and its well known that integer representation and computation have better performance than floating point numbers.

In regards to claim 36, the process of rendering a sequence of video frames includes the additional limitations of "for each frame to be rendered, initially assigning height values to each vertex of the grid associated with the combined texture map for the frame under consideration by, using integer computation". Arai (6121977) teaches of associating the image pixels of the image (or texture) with the plane surface of the body of water as shown in figures 1 and 34. Arai (6121977) suggest using integer computation in col 17, lines 7-10.

However, Arai (6121977) does not teach using a grid containing vertices. Colwell (5877777) in figure 2 shows the vertices of the grid assigned height values in order to represent the surface of a body of water. It would have been obvious to associate the vertices of Colwell (5877777) with the image or texture of Arai (6121977) for integer computation since they both used in representing the surface of a body of water.

The additional limitations of claim 36 closely follow those discloses in claim 13 and therefore is subject to the same prior art rejection.

In regards to claim 37, these limitations closely follow similar limitations contained within claim 14 and subject to the same prior art rejection.

In regards to claim 40, these limitations closely follow the limitations of claim 18 and subject to the same prior art rejection.

In regards to claim 41, the limitations of the claim are similar in function to those of described in claim 6, except that the vertex points are used instead of pixels. Therefore only differences will be addressed.

Arai (6121977) does not teach that for each vertex to be rendered will be "using the currently assigned height values of neighboring vertices to identify the grid coordinates of a different one of the grid vertices". Colwell (5877777) describes in equations 4 and 5 of using neighboring cells (vertices) to calculate water distortions and states "(equation 4) represent changes in the height of cell A due to fluid exchanges with all four neighboring cells B, C, D, E" (col 5, line 64 – col 6, line 2).

In regards to claim 45, Arai (6121977) does not teach that the process of rendering frames has limitations of "distorting the water region portion of the combined texture map to simulate a periodic wave". Colwell (5877777) shows a periodic wave resulting for a stone impact in the water in figure 5 and describes the waves as being "sinusoidal" (col 7, lines 5-7).

In regards to claim 46, the program module for periodic wave distortion has the additional limitation of "generating integer periodic waves" where "the grid of a texture map simulates the shape and location of a wave on the surface of a body of water". Arai (6121977) suggest using integer computation in col 17, lines 7-10. Arai (6121977) states "Another object of the present invention is ...

for creating an image which are capable of displaying ... movements of a water surface ... and waves in real time with satisfactory reality" (col 2, lines 15-19).

Arai (6121977) does not teach that the program module for periodic wave distortion where the wave height values to be rendered have the additional limitation of "using currently assigned height values of neighboring vertices and the periodic wave height values associated with those vertices to identify the grid coordinates of a different one of the grid vertices". Colwell (5877777) teaches of using of neighboring vertex height values to determine wave directions in col 6, lines 34-47.

Arai (6121977) does not teach that the program module for periodic wave distortion where the wave height values to be rendered have the additional limitation of "assigning the texture coordinates associated with the identified vertex to the vertex under consideration in lieu of the previously assigned texture coordinates". Colwell (5877777) teaches in equation 1 that all distortion including waves depends on fluid movement and that the vertices move and depend upon their previous values.

Allowable Subject Matter

6. Claims 8-11, 15, 17, 20, 23-25, 27, 31, 38-39, 42-44, and 47 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See form 892 for related art in the field on fluid or water graphics processing.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel F Hajnik whose telephone number is (703)-305-0544. The examiner can normally be reached on Mon-Fri (8:30A-5:00P).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark K Zimmerman can be reached on (703)-305-9798. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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